

## CHAPTER 10

# OCCUPATIONAL HEALTH

When you have read and understood this chapter, you should be able to answer the following learning objectives:

- Describe the Navy's asbestos control program.
  - Describe the Navy's hearing conservation program.
  - Describe the Navy's heat stress program.
  - Describe the Navy's sight conservation program.
  - Describe the Navy's respiratory protection program.
  - Describe the Navy's hazardous material and hazardous waste program.
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This chapter will give you broad coverage of the material described in the learning objectives. If you have definite responsibilities in any of the programs discussed, refer to those subjects in the *Navy Occupational Safety and Health (NAVOSH) Program Manual*, OPNAVINST 5100. 19B.

### THE ASBESTOS CONTROL PROGRAM

Asbestos is a fibrous mineral that can be used to produce a fireproof material with high tensile strength, good heat and electrical insulating properties, and moderate to good chemical resistance. Because of these characteristics, asbestos is normally found aboard older ships in insulation (lagging) for high temperature machinery, boilers, and piping and in certain deck tiles and decorative paneling. Most new ships commissioned through 1976 contain some asbestos thermal insulation. Since 1974, most thermal insulation has been replaced with nonasbestos material.

Asbestos is a known health hazard if it is absorbed into the body. Asbestos materials used aboard ship are normally not health hazards when they are in good condition, secured in place, and unlikely to be disturbed. Bound asbestos materials, such as gaskets, floor coverings, and cements are not normally health hazards unless you punch, grind, machine, or sand them, or when the material deteriorates. Our primary concern is asbestos that may become airborne through disturbance, damage, or friability. (Friable asbestos is loosely bound and the fibers may easily be crumbled or pulverized.)

Exposure to asbestos causes no known acute, immediate effects—most effects appear years after

exposure. This can cause carelessness, so be sure your people understand the long-term effects. There is only one way to prevent the possibility of asbestos-related illness, and that is to avoid exposure. The Navy has instituted a program to control the use of asbestos and to replace any removed asbestos with a nonasbestos substitute wherever possible.

The feasibility of evaluating the risk of specific exposures varies from ship to ship. Some tenders and repair ships have devices to collect samples of airborne asbestos and personnel trained to use those devices and interpret the results. Those ships should apply the measurement procedures outlined in this chapter. Other ships should assume that all thermal insulation contains asbestos unless they know otherwise. They should then adopt the protective measures that are required where asbestos materials are worked.

The guidance in this chapter applies to afloat units. All ships should limit the removal of asbestos to emergency or operational readiness repairs to piping or equipment. Replace insulation with nonasbestos materials. Handle all other asbestos work according to the Current Ship's Maintenance Plan (CSMP), which calls for work to be done by a trained and equipped personnel at an intermediate maintenance activity (IMA) during repair availabilities.

### PROGRAM ELEMENTS

An industrial hygienist is usually the best person to understand and deal with asbestos hazards. Few ships have industrial hygienists, but some will have a corpsman trained to work with asbestos hazards. The

asbestos control program consists of the following elements:

- Identify asbestos hazards.
- Control asbestos in the workplace.
- Follow prescribed work practices.
- Properly dispose of waste materials containing asbestos.
- Use the Asbestos Medical Surveillance Program (AMP).
- Train personnel to recognize asbestos hazards and use precautions.

## **IDENTIFYING ASBESTOS HAZARDS**

An industrial hygienist is required to survey all workplaces at least once every 18 months to identify asbestos hazards and recommend ways to eliminate or minimize them.

Each time you plan to remove or repair thermal insulation, you should try to determine whether it contains asbestos. Ships such as tenders usually have laboratory facilities to identify asbestos, and the only acceptable identification is that done with polarizing light. You cannot identify asbestos only by visual inspection, and you should never depend on any manufacturer's marking that identifies insulation as having no asbestos. If you cannot have the insulation tested properly, always assume it contains asbestos, especially on ships that were built before 1976.

## **CONTROL OF ASBESTOS IN THE WORKPLACE**

There are five basic means to control asbestos hazards in the workplace: (1) substitute less-hazardous materials, (2) use engineering controls such as isolation or ventilation, (3) use administrative controls, (4) use personal protective equipment, and (5) rotate personnel in hazardous spaces to keep their exposure below the permissible exposure limit (PEL). The ship should prepare asbestos control procedures that set forth its engineering and work practice controls and have them ready for review.

Whenever possible, an IMA or shore facility should repair or remove asbestos insulation, using personnel who are part of an ongoing AMP. When this work must be done at sea, the CO should authorize it and assign an

officer or petty officer trained in asbestos removal to supervise the work.

Each ship that has asbestos thermal insulation on board must have a three-person team trained to remove the asbestos and to use protective equipment needed for the work. The team should be made up of a supervisor, a cutter, and a cleaner. The cutter moistens, cuts, and removes insulation. The cleaner vacuums continuously near the repair to minimize the spread of dust and helps moisten the cut surfaces. The ship's allowance list (AEL) includes the necessary protective equipment.

## **General Workplace Control Practices**

Each ship should implement the following general practices to protect personnel from asbestos hazards:

- Use substitute materials approved by NAVSEA in place of asbestos-containing materials. Set a high priority on the replacement of material containing friable asbestos.
- Always try to wet asbestos before you work with it to prevent airborne fibers from exceeding the PEL.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the area where asbestos work is underway.
- Develop procedures to minimize the accumulation of asbestos-laden waste dust and scrap materials. These should include wetting the material and using high-efficiency particulate air (HEPA) vacuum cleaning.
- Collect and dispose of asbestos waste, scrap, debris, containers, equipment, and asbestos-contaminated disposable clothing in sealed impermeable bags or other impermeable containers. Be sure these containers are colored distinctively for easy recognition. Double-bag asbestos waste before you dispose of it.
- While at sea, try to limit asbestos work to small scale, short duration repair or maintenance activities such as those in the following paragraphs:
  - Make minor repairs of insulation on pipes. A minor repair means you may remove and reinstall less than 3 linear feet of pipe insulation or less than 3 square feet of insulation on surfaces other than pipe.
  - Replace asbestos-containing gaskets.

- Install or remove electrical cables through or near asbestos-containing materials.

### **Personal Protective Clothing**

Personnel who handle asbestos-containing materials where the concentration of airborne fibers is likely to exceed the PEL should wear protective clothing. Be sure all openings are closed and that the garment fits snugly around your neck, wrist, and ankles. Tape the junctions at the wrist, ankles, and collar as necessary to prevent skin contamination. The following paragraphs list recommended items and precautions:

- Wear a full-body, one-piece, disposable coverall preferably made of Tyvek or a comparable substitute. Use a Tyvek coverall with attached hood if possible.
- Hoods should extend beyond the collar of the overall and completely protect the neck. The hood should be made of Tyvek or a comparable substitute.
- Wear medium-weight rubber gloves and a thin cotton “under glove” to absorb perspiration.
- Wear slip-resistant plastic shoe covers or heavy polyethylene shoe covers with slip-resistant soles or lightweight rubber boots.
- Wear face shields, vented goggles, or other appropriate eye protection equipment whenever there is a possibility of eye irritation.

### **Respiratory Protection**

When you are doing asbestos work and the concentration of airborne fibers is unknown, wear a full-facepiece, continuous-flow coupled air respirator. The Ambient Air Breathing Apparatus meets this requirement. Personnel who are not working on asbestos but are in the space for other reasons should wear at least a half-mask air purifying respirator equipped with a high-efficiency filter.

### **Warning Signs and Labels**

The command should display warning signs at each location where concentrations of airborne asbestos fibers may exceed the PEL. Post the signs at a distance from the area to warn anyone who may be approaching. The signs may include a list of the protective equipment required for the area. The sign should contain at least the following information:

**DANGER, ASBESTOS. CANCER AND LUNG DISEASE HAZARD. AUTHORIZED PERSONNEL ONLY. RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA.**

There may be conditions where containers of raw materials, mixtures, scrap, waste, debris, and other products containing asbestos could increase the surrounding levels of airborne asbestos fibers. If so, place warning labels on the containers in letters that are visible and legible. The labels should contain at least the following information:

**DANGER, CONTAINS ASBESTOS FIBERS. AVOID CREATING DUST. CANCER AND LUNG DISEASE HAZARD.**

### **Workplace Release Criteria**

There are a few simple but necessary guidelines you should follow before you reoccupy a space where asbestos work has been done. Conduct a critical visual inspection after clean-up to be sure the area is clean and free of visible asbestos dust. The safety officer must conduct the inspection after emergency or operational readiness repairs at sea. Do not release an asbestos controlled area for unrestricted access nor for air sampling until the area has first been thoroughly cleaned and inspected. Use local exhaust ventilation if necessary to be sure the atmospheric levels of asbestos do not exceed PELs.

### **DISPOSAL PROCEDURES**

There are a few simple but important guidelines you should follow to dispose of asbestos waste. Be sure the waste is wet if conditions justify. Double-bag the waste in heavy-duty plastic bags or other suitable impermeable containers that are color-coded for easy recognition. Be sure all bags or containers have standard asbestos warning labels. Be careful that bags and other containers do not rupture when they are transported to a shore activity for disposal.

For guidance concerning specific health-related precautions to be used for specific operations, consult the cognizant industrial hygienist.

### **ENVIRONMENTAL PROTECTION LAWS**

Repairs done at sea are not subject to the Environmental Protection Agency's (EPA) emission

standards for asbestos. However, tenders and repair ships that do asbestos work in port in other than emergency conditions must comply with EPA standards.

## **TRAINING**

Shipboard asbestos removal teams should be trained through a formal course of instruction at a fleet training center, at a ship repair facility, or at a shipyard lagging shop. All hands who work in areas that contain asbestos insulation should be trained to recognize and report damaged asbestos material. Copies of training handouts should be available to personnel upon request. Training records should identify the individuals and dates of training. All personnel who are now exposed or may be exposed to asbestos (such as an emergency repair team) and their division officer and work center supervisors should receive training in the following subjects at or before their initial assignment and each year thereafter:

- An overall review of the command's and activity's asbestos program
- The health effects and hazards of asbestos
- The association between the smoking of tobacco products and exposure to asbestos in producing lung cancer
- The engineering controls and work practices associated with an individual's work assignment
- The purpose, proper use, and limitations of protective equipment
- The purpose and description of the AMP
- The description of emergency and clean-up procedures

## **THE HEARING CONSERVATION PROGRAM**

The Navy recognizes hearing loss as an occupational hazard that requires considerable attention. It is more common in ratings where personnel are exposed to high-intensity noise, such as gunfire or missile fire, and intermittent noise, such as jet or propeller aircraft, engineering machinery, and equipment. This section gives a broad view of the hearing conservation program, but there may be unique noise conditions that do not fall under current instructions and guidelines. In those cases, the responsible party should request guidance and approval

from the Navy Environmental Health Center (NAVENVIRHLTHCEN).

## **PROGRAM ELEMENTS**

The goal of the hearing conservation program is to prevent occupational hearing loss among Navy personnel as far as possible. The program includes the following elements:

- Survey work environments to identify hazardous noise levels and personnel at risk.
- Modify areas and equipment that produce hazardous noise and reduce noise levels to acceptable limits. Use personal hearing protective equipment as an interim measure while exploring engineering methods to reduce noise. Use administrative controls where engineering controls are not feasible. Use hearing protective devices as a permanent measure only if engineering or administrative controls are not feasible.
- Conduct periodic hearing tests to monitor program effectiveness and to detect early changes in hearing before permanent hearing loss develops. Provide follow-up diagnostic evaluation and treatment for all personnel found to have loss of hearing.
- Train all personnel who are exposed to hazardous noise environments to understand that permanent loss of hearing is possible unless they protect themselves. Train them in the command's responsibility to protect against hearing loss, and the individual's responsibility to follow command procedures. Train them to use hearing protective devices both on and off duty if they are in a noise hazard area.

## **NOISE MEASUREMENT AND EXPOSURE ASSESSMENT**

Before we can control noise, we must measure it according to standard procedures and then evaluate it against accepted criteria. Industrial hygienists or others trained in the procedures will normally measure the noise throughout the ship at each 18-month baseline industrial hygiene survey. They also will do a follow-on survey but they need not take actual measurements at that time unless there is doubt about the baseline measurements. The safety officer should keep a copy of the record of noise measurements until it is superseded by a later survey. An industrial hygienist or other trained

person will use the baseline noise measurements to assess the noise and recommend modifications if necessary. This is a complex task and may require specialized acoustical instruments. If the ship does not have access to a formal noise assessment, you should assume personnel who work in noisy areas are at risk and protect them as well as possible under the guidance of this program.

In some cases, industrial hygienists may decide that hearing protective devices do not give enough protection in a particular location. They will then analyze noise levels at that location from 84 dB continuous or intermittent noise to 140 dB peak sound pressure for impact or impulse noise. They will determine the potential hazard and recommend modifications in noise reduction or hearing protection to reduce it. They will resurvey within 30 days after any modification that might alter the intensity of noise and recommend action based on the results.

In areas where there is a strong potential for hearing damage, a medical officer or audiologist will conduct hearing medical surveillance on personnel who work in the areas. They will use their findings to decide if and under what circumstances personnel may continue to work there. They may recommend a reduction in noise, better hearing protective equipment, or both.

It may not be necessary to apply all hearing protection measures in every case, but qualified professionals using approved methods should make that decision. For example, personnel who sometimes enter noise hazard areas may have to wear hearing protective equipment, but they will not need to have their hearing tested. At other times, noise may be intermittent and may not require personnel to wear hearing protective equipment. These waivers must be justified and documented.

## **HEARING TESTS AND MEDICAL EVALUATION**

All personnel will receive a baseline hearing test when they enter the Navy. The results will serve as a reference for further testing as long as they are in the Navy. Hearing tests done at military entrance stations will not be used for this purpose.

Personnel who are assigned to duties in designated noise hazardous areas or who operate noise hazardous equipment will be included in the hearing conservation program. An MDR will give these personnel a hearing test annually for as long as they remain in a noise hazardous environment and will enter the results in their

medical files. The MDR will give additional hearing tests if anyone in the program develops hearing problems.

## **PERSONAL HEARING PROTECTIVE DEVICES**

Personal hearing protective devices should reduce noise to a level where it does no harm to hearing. However, only an industrial hygienist or other competent person can decide which device or combination is suitable in each noise hazard situation. Normally, the correct devices will have been selected and they should be available to you whenever you enter designated noise hazard areas. You should wear them at all times when the noise sources are operating, especially if you are subject to the noise of gun or missile firing. When sound levels exceed 104 dB, you should wear double protection; a combination of insert-type and muff-type hearing protection devices.

## **LABELING HAZARDOUS NOISE AREAS**

Label all hazardous noise areas and equipment that produce hazardous noise with approved decals or labels. The labels are NAVMED 62602, Hazardous Noise Warning Decal (8" x 10-1/2"), NS0105-LF-206-2605, and NAVMED 6260/2A, Hazardous Noise Label (1" x 1-1/2"), NSN0105-LF-21 2-6020. Normally, you should post the outside of doors and hatches leading into a noise hazardous area, but this does not include weather surfaces. If a noise hazardous area has an entrance from a weather deck post the warning on the inside of the weather deck door or hatch. Do not label exteriors of military combat equipment, but notify the personnel who operate and maintain the equipment about any noise hazards. All hands are expected to comply with hazardous noise labels wherever they appear.

## **REDUCING NOISE**

Most work to reduce or eliminate noise will be done when the ship and its equipment are designed, constructed, and tested, or following post-overhaul baseline surveys. Any hazardous noise areas not identified during those times are most likely due to malfunctioning equipment. Other recommendations for noise reduction may come from industrial hygienists or other workplace inspections, such as zone, INSURV, ISIC, or TYCOM. The CO should correct these problems as soon as possible.

## **TRAINING**

Personnel in the hearing conservation program should receive 1 hour of training on the program before they go to work, and annually thereafter. The training should include the following topics:

- The elements and rationale for the program
- Designated noise hazardous areas and equipment
- Proper use and maintenance of hearing protective devices, including the advantages and disadvantages of each type
- The necessity for periodic hearing testing
- Individual responsibilities
- Off-duty hearing conservation
- The effects of hearing loss on career longevity, promotion, and retention
- The incidence of hearing loss within the individual's work spaces

## **RECORDS**

Noise measurement data, including audiometric records and information in a person's health record should be retained as required by current directives. The following specific records should be kept:

The MDR should record the results of hearing tests and exposure assessments in each person's health record. This includes reference audiograms, evaluations, dispositions, and referrals. Reference hearing tests should be recorded on form DD 2215 and monitoring tests on form DD 2216. Individual exposure level data should be recorded on the DD 2215 or DD 2216 in the Location-Place of Work section. The first copy of each of these forms should be sent to NAVENVIRHLTHCEN. The second copy should be kept for local use and may be destroyed when no longer useful.

The MDR should keep a roster of personnel who routinely work in noise hazardous areas and update it as needed and at least annually. The MDR should use this tickler file to schedule annual audiometric examinations of these personnel.

## **THE HEAT STRESS PROGRAM**

Heat stress is caused by certain combinations of air temperature, thermal radiation, humidity, airflow, and

workload that reduce the body's ability to adjust. Body temperature increases cause fatigue, severe headaches, nausea, and reduced physical and mental performance. If exposure is prolonged, the body's temperature may increase and lead to heat exhaustion or heatstroke. These injuries can be life threatening if they are not treated immediately. However, heat exposure occurs gradually, and the effects are reversible if you follow precautions. This section will cover the procedures we use to prevent heat stress.

## **CONDITIONS LEADING TO HEAT STRESS**

Heat stress can occur in most places throughout a ship. However, the worst conditions are usually found in areas that generate extra heat, such as machinery spaces, laundries, sculleries, and steam catapult rooms. The most common correctable causes of heat stress are steam and water leaks, boiler air casing leaks, missing or deteriorated thermal insulation, ventilation systems defects, and weather conditions of high heat and humidity. You can help reduce these conditions with proper maintenance on equipment that contributes to high heat and humidity.

## **HEAT STRESS SURVEYS**

Heat stress surveys are used to determine stay time, or how long a person may work at a given watch or work station before there is danger of heat stress. More strenuous work reduces stay time. Conduct heat stress surveys at work or watch stations under any of the following conditions: (1) when dry-bulb temperature exceeds 100°F, (2) when heat or moisture is unusually high, and (3) before engineering casualty control drills. The next paragraphs describe the basic procedure used in a heat stress survey; always refer to the instructions before you begin.

1. First, use a WGBT meter to measure dry bulb, wet bulb, and globe temperatures at your watch or work station and convert the readings to a WGBT index.

2. Next, enter the WGBT index on a PHEL chart. The PHEL chart contains six physiological heat exposure limits, or PHEL curves, that show the average stay time in a given work environment before you are in danger of heat stress. The curves range from light work (PHEL curve 1) to heavy work (PHEL curve VI).

3. The WGBT index entered on the appropriate curve on the PHEL chart will give you the maximum time (stay time) you should remain at your station before resting.

4. Add any notes on conditions in the space that increase heat.

5. When results show that personnel will be exposed to heat stress in less than 4 hours, send the results to the CO promptly.

When stay time is greater than the duration of a watch or work period (normally 4 hours), conduct the next survey during the hottest time of the day. If the stay time is greater than the normal watch or work period at the hottest time of day, then you need only two surveys each day.

When stay time is less than the watch or work period, conduct a survey at least once per stay-time period. If you conduct more than one, conduct them at about equal intervals. In these cases, be sure to record the outside weather dry-bulb and wet-bulb temperatures. Compare those temperatures with those at work or watch stations to learn how much moisture is being added to the space due to steam and/or water leaks.

## **RECOVERY TIME**

When personnel leave a heat stress environment because they have reached or exceeded their stay time, they should stay in a cool, dry area that will help a rapid recovery. The length of recovery time in a cooled space should be twice the exposure time, or 4 hours, whichever is less. If there is evidence of cumulative fatigue, the recovery time should be longer. When personnel who complete recovery periods are often unable to carry out normal work, or have frequent health disorders, they should be sent to the ship's medical department for evaluation.

## **PRECAUTIONS AGAINST HEAT STRESS**

Learn the symptoms of heat injury and take action if you see the symptoms in yourself or others. Get treatment in sickbay for heat rash or heat cramps. Report victims of heat exhaustion for treatment. Heatstroke is a medical emergency; cool the victim by any possible means and get medical help immediately. If you are often exposed to heat stress environments, take the following precautions:

- Eat three well-balanced meals daily.
- Drink plenty of water.
- Do NOT take salt tablets.

- Do NOT drink commercial electrolyte supplements instead of water.
- Get at least 6 hours continuous sleep every 24 hours.
- Do NOT wear starched clothing.
- Wear clean clothing made of at least 35 percent cotton (more natural fiber content means more evaporation).

## **SIGHT CONSERVATION PROGRAM**

Navy policy requires eye protection for personnel who work in or visit areas or operations where there is danger of injury to the eyes. This section will give you an overview of the sight conservation program that implements the policy. Refer to instructions for more detailed information.

## **PROGRAM ELEMENTS**

Each command will implement a sight conservation program that will include at least the following elements:

- Use zone inspections and industrial hygiene survey results to designate eye hazardous areas, processes, and operations.
- Implement a ship's vision screening program using shore-based medical facilities.
- Maintain sight protection equipment.
- Establish procedures for the use of temporary eye wear.
- Establish emergency eyewash facilities.
- Follow approved safety standards that require protective eye wear.
- Establish training and program enforcement procedures.

## **EYE HAZARD AREAS**

Responsible personnel will conduct a survey of all work areas, processes, and operations to identify those that may be hazardous to the eyes. This survey will be part of the workplace inspection and industrial hygiene survey. The safety officer will keep a list of all areas, processes, and operations that require eye protection.

Each eye hazardous area will be marked by a 3-inch strip of black and yellow checkerboard pattern on the deck and a warning sign. The warning sign will be directly mounted on the hazard, component, machinery, boundary bulkhead, or door in a conspicuous location and will read:

### **WARNING**

#### **EYE HAZARD**

The word *WARNING* will be in yellow letters on a black background, and the words *EYE HAZARD* will be in black letters on a yellow background.

### **EYE PROTECTION DEVICES**

Some examples of devices for eye protection are safety glasses, chipper's goggles, welder's goggles, chemical goggles, face shields, and prescription safety glasses. All such devices must be selected according to *Navy Occupational Safety and Health (NAVOSH) Program Manual*, OPNAVINST. 5100.19B. They must be adequate for the specified hazards, be reasonably comfortable, fit snugly, and not interfere with movement any more than necessary. They must be durable, easy to clean, and capable of being disinfected. Trained personnel will issue personal eye wear and fit it at the time of issue. Eye wear furnished under the sight conservation program is Navy property and will be repaired or replaced if it is damaged.

All personnel who enter hazardous areas should wear protective eye wear. This includes crew members, visitors, supervisors, or personnel passing through. The command will procure enough heavy-duty goggles and/or plastic eye protectors for anyone entering an eye hazard area.

The ship's supply department will order eye and face protection devices through the supply system. They should check each item as it is received to be sure it is labeled "Z87." This shows that the device complies with American National Standards Institute (ANSI) Z87.1-1979.

Each person is expected to keep eye protection equipment clean and fully operational and to use it properly at all times. If eye protection equipment will be reissued to a different person, it should first be sanitized with hot, soapy water and rinsed of all traces of soap or detergent. It should then be immersed for 10

minutes in a chlorine bleach solution, then rinsed and air dried.

### **EMERGENCY EYEWASH FACILITIES**

The ship should have a combination of emergency shower and eyewash or eye/face wash units in all areas where the eyes of crew members may be exposed to corrosive materials. Self-contained eyewash units will be provided where potable water and drainage is not available. The units should be of a type to treat the eye damage that might occur in the particular area. Each station should be clearly marked with a safety instruction sign of white lettering against a green background. Signs should be posted in a visible location close to the eyewash unit to identify it as an emergency eyewash station. No unit will be more than 10 seconds or more than 100 travel feet from the hazard. Anyone who uses an emergency eyewash should be examined by medical personnel.

Each eyewash station located in remote or minimally manned areas should have a visual and audible alarm that will be activated when the unit is used. The alarm should be located in an area where it can always be seen and/or heard. A label plate should be located at eye level in the immediate vicinity of the visual alarm and should contain the following words:

### **WARNING**

When the emergency shower (eyewash, eye/face wash) in (shop or space location) has been activated, provide immediate personnel assistance and notify sickbay.

### **THE RESPIRATORY PROTECTION PROGRAM**

Many repair and maintenance operations generate air contaminants. Engineering controls, such as local exhaust ventilation, are the most effective means to protect personnel against these contaminants. However, when engineering controls are not practical or feasible, respirators are necessary to assure the protection of personnel. This section gives you an overview of respirators. Always read the instructions for a given type of respirator before you use it.

**NOTE:** Military gas masks and medical/dental surgical masks may NEVER be used as air-purifying respirators. Gas permeable and soft contact lenses may be worn with all respiratory protection.



## PROGRAM ELEMENTS

This section explains respirator program requirements. It applies to all personnel and visitors who enter an area where respiratory protective equipment is necessary. This section does not address damage control, gas free engineering, or underwater protection. The respiratory protection program includes the following elements:

- Written standard operating procedures
- Proper, hazard-specific selection of respirators
- User training in the proper operation and limitations of respirators
- Regular cleaning and disinfecting of respirators
- Convenient, clean, and sanitary storage of respirators
- Inspection, repair, and maintenance of respirators
- Industrial hygiene surveys to identify operations requiring respirators and recommend specific types of respirators
- Use of only those respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and Mine Safety and Health Administration (MSHA)

## TYPES OF RESPIRATORS

The two basic types of respirators are air-purifying and atmosphere-supply. We will explain each in the following paragraphs.

### Air-Purifying Respirators

This type of respirator removes air contaminants by filtering them or by absorbing them as the air passes through the cartridge. In all cases when using air-purifying respirators, the atmosphere must contain enough oxygen, at least 19.5 percent by volume. They are available with different types of facepieces for different levels of protection, and they come in disposable and reusable models. The cartridges, filters, and prefilters must be a type that is effective against the contaminant present at the time of use. Air-purifying respirators may be either nonpowered or powered. The nonpowered type depends on the user's lungs while the powered type uses a fan to lower breathing resistance. Air-purifying respirators are divided into two types that

we will explain in the next paragraphs. One protects against particulate and the other protects against gas and vapor.

**PARTICULATE AIR-PURIFYING RESPIRATORS.**– These respirators use cartridges, filters, and prefilters to protect against aerosols, that is, solid or liquid particles dispersed in air. They remove toxic and nontoxic dust, fog, fumes, mist, smoke, and sprays either singly or in combination.

**GAS AND VAPOR AIR-PURIFYING RESPIRATORS.**– These respirators use cartridges and canisters to remove contaminants through absorption. Most cartridges remove a specific type of gas or vapor, such as organic vapors, acid gases, ammonia, or carbon monoxide.

**FILTERS, CARTRIDGES, AND CANISTERS.**– Some manufacturers of air-purifying respirators combine the removal capabilities of two or more type cartridges in a single cartridge. Others allow you to screw together cartridges and combine their capabilities. All manufacturers allow you to attach a prefilter to a cartridge and combine different degrees of particulate removal. Always follow the manufacturer's recommendations when you combine filters, cartridges, and canisters.

Federal regulations require that each type of respirator cartridge/canister be color-coded to identify its intended use. See the *Navy Occupational Safety and Health (NAVOSH) Program Manual*, OPNAVINST 1500. 19B, for information on color coding.

Each cartridge/canister is labeled with the contaminant(s) it protects against and the NIOSH/MSHA approval number. Some labels may provide more information about the cartridge's capabilities and limitations.

### Atmosphere-Supplying Respirator

These types of respirators are used when the contaminant has no warning property (odor), when the contaminant's concentration is too high to use an air-purifying respirator, or when the environment is immediately dangerous to life and health (IDLH). The two types of atmosphere-supplying respirators are supplied-air respirators and self-contained breathing apparatuses (SCBA). We will explain each of them in the following paragraphs.

**SUPPLIED-AIR RESPIRATORS.**– These are further divided into hose masks and air-line respirators described in the next paragraphs.

**Hose Mask Respirators.**– These consist of a facepiece, breathing tube, harness, and large diameter, thick wall, nonkinking, air supply hose. The air may be supplied by a blower, either motor or hand driven.

**Air-Line Respirators.**– These consist of a facepiece, hood, helmet or suit, breathing tube, regulator, and small diameter hose provided with some means to attach the hose to the user. Air is provided by a compressor, ambient air breathing apparatus (AABA), or compressed air cylinders. There are three types of air-line respirators.

1. Demand: Available only with a facepiece, it supplies air to the user on demand (when he inhales).
2. Pressure Demand: Available only with a facepiece, it maintains a continuous positive pressure within the facepiece.
3. Continuous Flow: Available with facepiece, hood, helmet, or suit, it provides a continuous positive pressure and flow of air.

**SELF-CONTAINED BREATHING APPARATUSES.**– These consist of a facepiece, helmet or hood, a breathing tube, and a source of air or oxygen, all of which are carried by the wearer. SCBAs are divided into the following closed- and open-circuit types:

**Closed Circuit.**– In closed circuit, or rebreathing, SCBAS, carbon dioxide (CO<sub>2</sub>) in the exhaled breath is removed by a chemical canister, and the remaining air is rebreathed. There are two types: In one type the oxygen is provided by either high-pressure gaseous oxygen or gaseous oxygen converted from liquid oxygen. In the other type the water vapor in the exhaled breath reacts with a chemical in the canister to release oxygen. The Navy oxygen breathing apparatus (OBA) is an example of the second type. The OBA is not approved by NIOSH/MSHA for commercial use, and it is only authorized for damage control and fire-fighting operations aboard ship. OBAs MUST NOT be used in flammable atmospheres because of the heat generated by the canister.

**Open Circuit.**– In this type of SCBA, the exhaled air is expelled to the atmosphere, and air is provided to the user from a compressed air cylinder. This type of respirator is available in either a demand or pressure-demand model.

**Emergency Escape Breathing Device (EEBD).**– This is a special type of SCBA developed specifically for emergency escape from shipboard fires. It has a short-duration air supply. IT MUST NEVER BE

USED TO ENTER A HAZARDOUS ATMOSPHERE;  
IT IS FOR ESCAPE ONLY!

## SELECTING RESPIRATORS

Use only respirators that are jointly approved by NIOSH/MSHA. If there is any doubt as to the respirator required to protect against a particular contaminant, ask an industrial hygienist.

Different respirators protect against different contaminants and concentrations of contaminants, so you must select one that protects you from specific contaminants. The industrial hygiene surveys will give you information on how to match contaminants and respirators. Or if you need new information, ask an industrial hygienist for help. Before you select a respirator, always ask the following questions about the conditions where you plan to use it:

- What are the warning properties of the contaminant (smell, eye irritation, or respiratory irritation)? Some contaminants do not have enough warning properties to alert you to respirator failure. Vapor- and gas-removing respirators are not approved for some contaminants that include carbon monoxide, hydrogen cyanide, isocyanates, and methyl alcohol.
- Is the contaminant absorbed through the skin?
- Are any of the contaminants IDLH, or will they cause ill effects after prolonged exposure?
- What is the concentration of the contaminant in the atmosphere?
- What are the NAVOSH standards for maximum levels of contamination in a given environment?
- Is the atmosphere oxygen deficient or oxygen rich or will such conditions be created?
- What is the nature, extent, and frequency of the duties to be performed in the work area?
- What degree of protection is provided by the particular respirator?

## USING RESPIRATORS

Before you may use a respirator, you must meet the following requirements:

- Be certified by the MDR as medically qualified to use each type of respirator required.

- Pass a fit-test with each type of respirator you may use.
- Be trained to use the respirator(s).

### Checking Facepiece Seals

Complete the following seal checks on the facepiece when you first put on a respirator:

**POSITIVE PRESSURE CHECK.**– Place your palm or thumb over the exhalation valve and press lightly. Exhale gently. The respirator is properly sealed if no air leaks around the edges and you feel a slight positive pressure inside the facepiece.

**NEGATIVE PRESSURE CHECK.**– Place your palm(s) over the cartridge(s) or canister inlet. Inhale gently. The respirator is properly sealed if no air leaks around the edges and you feel a slight negative pressure inside the facepiece as it collapses slightly towards the face.

### Inspecting Respirators

Inspect all respirators routinely before and after use. Inspect emergency use respirators after each use and at least monthly. Inspect SCBAs before and after each use and at least monthly. In all inspections, look for any defects in fit; seal; material; filter, cartridge, or canister selection; cleanliness; and function.

## THE HAZARDOUS MATERIAL/WASTE PROGRAM

Navy ships require hazardous material (HM), therefore they produce hazardous waste (HW). The hazardous material/waste program was developed to manage both HM and HW. This chapter will cover the general requirements for HM and HW, both of which are a chain of command responsibility that begins with the individual sailor and extends to the commanding officer.

### PROGRAM ELEMENTS

The following elements are needed to carry out an effective HM/HW program:

- Designate adequate storage for HM/HW.
- Control purchasing, receipt, and issue to avoid accumulation of excess HM.
- Follow approved safety standards for the use of HM.
- Collect, segregate, and dispose of HW.
- Respond to HW emergencies.
- Obtain material safety data sheets (MSDSs) for onboard HM.
- Train personnel as necessary.

## HAZARDOUS MATERIAL

HM is any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a substantial hazard to human health or the environment when purposefully released or accidentally spilled. The most common HM are flammable/combustible materials, toxic materials, corrosive material (including acids and bases), oxidizing materials, aerosol containers, and compressed gases.

There are other HM that we will not cover in this manual because the engineering department is seldom involved with them. They are ammunition, weapons, explosives, explosive-actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, and radioactive materials.

## HAZARDOUS WASTE

HW is any discarded material (liquid, solid, or gas) that meets the definition of HM and/or is designated as a hazardous waste by the EPA or state authority. The term *hazardous material turned into store* (HMTIS) refers to usable HM in excess of a ship's needs and awaiting transfer to a shore activity. The term *hazardous material turned into disposal* (HMTID) refers to nonusable HM awaiting transfer to a shore activity for disposal.

## MATERIAL SAFETY DATA SHEETS

MSDS are technical bulletins that contain information about material such as composition, chemical and physical characteristics, health and safety hazards, and precautions for safe handling and use. MSDSs are required for every HM and they must be readily available to personnel who use or handle HM. The Naval Safety Center assigns numbers to all MSDSs used by forces afloat. MSDS numbered stickers are provided to help correlate the MSDS to the product label for ready reference, recognition of hazardous material, and training. All personnel using HM must be trained to

read and understand the dangers and precautions described on the MSDS before they actually use the materials.

## **STORING HM/HW**

Material normally thought to be safe may be hazardous under certain conditions. Therefore, it must be stowed so incompatible chemicals are separated. Store all large quantities of flammable and combustible liquids with a flash point less than 200°F, and coolants, hydraulic fluids, lubricants, and aerosols in flammable liquid storerooms, ready service storerooms, or issue rooms. When flammable liquids are used frequently, store limited quantities in flammable liquid cabinets near the work space. Do not use these cabinets to store more than 30 gallons of flammable liquid per space.

The HM/HW coordinator should keep a list of all stowage locations for HM/HW, the capacity of each, and the type of material for which each is designated. The XO, safety officer, and department heads should review the list annually to find ways to minimize storage locations by consolidating compatible materials. The gas free engineer, damage control assistant, and MDR should get a copy of the list. If the ship does not have enough protected, ready service stowage for HM, the CO should request a SHIPALT to provide the space.

Equip HM stowage locations other than cabinets and lockers with supply and exhaust ventilation. The industrial hygiene officer will decide if ventilation is adequate. Restrict access to HM stowage locations to personnel authorized by the responsible division officer. The gas free engineer must approve entry to confined locations.

Hold weekly and quarterly inspections of all HW storage spaces. Look for loosely fitted closures, corrosion, leakage, improper or inadequate labeling, and expired shelf life. Report any dangerous situations to the responsible division officer and the HM/HW coordinator.

Post stowage cabinets with warning signs to show the type of HM stored. If lockers and cabinets contain flammable and combustible liquids, attach a permanently mounted label with the following words:

### **FLAMMABLE/COMBUSTIBLE LIQUIDS**

**DURING STRIP SHIP CONDITION, THE  
CONTENTS OF THIS CABINET SHALL BE  
RELOCATED TO A FLAMMABLE LIQUIDS**

## **STOREROOM, ISSUE ROOM, OR READY SERVICE STOREROOM.**

## **CONTROLLING HM/HW**

When your ship receives HM through the supply system, check all containers to be sure they contain a manufacturer's label; you may refuse the item if it has no label. If the ship receives containers of HM through open purchase, accept them only if they contain a manufacturer's label and the ship has an MSDS for the material. When HM containers are accepted and brought aboard, immediately place them in an appropriate stowage location based on the hazard identification.

## **Marking HM Containers**

Manufacturer's labels for shipboard identification of HM containers must clearly identify the material name, the manufacturer's name and address, and the nature of the hazard presented by the HM. When you dispense hazardous material from the shipping container to an unmarked container, mark the receiving container with the same information.

## **Issuing HM**

Issue HM from the flammable liquids storeroom or other issue rooms in amounts you need to satisfy immediate needs during a work shift. Generally, you should not keep more than a week's supply of a routinely used item in or near the user compartment.

## **Open Purchase of HM**

COs may authorize open market purchases of HM when the stock-numbered product is clearly inferior or when supply cannot meet an urgent need. Get an MSDS from the manufacturer or supplier before buying the new product, and be sure the new product is NOT more hazardous than the stock item. When you believe the stock item is inferior, you must justify your position to the supply officer, who will then submit a COSAL feedback form.

## **Inventorying HM**

In addition to an up-to-date running inventory of HM, your ship must hold an annual inventory of all HM aboard. The inventory will be compared with the ship's hazardous material list (SHML) and presented to the supply officer, the responsible division officer, and the

HM/HW coordinator, who will decide if any action is needed to satisfy operational requirements.

## **HM and Combat Readiness**

Each ship should establish procedures to identify, mark, evaluate, and eventually remove HM in preparation for battle (a strip ship bill). Most HM can be dangerous to personnel and the ship if they are opened or set on fire during battle. Give priority to HM that supports or accelerates fires or produces toxic combustion products.

### **Removing Excess HM**

Turn over any excess HM to the supply department for off-loading to the appropriate shore activity as HMTIS. Label each container and include a DD form 1348-1.

## **COLLECTING AND DISPOSING OF HAZARDOUS WASTE**

Controlled disposal of shipboard HW is an important element in the Navy's HM/HW management program. Carefully follow the shipboard HW disposal and off-loading practices to keep down the workload and to comply with HW regulations. The disposal requirements we have explained in the next paragraphs do not preclude the discharge of HM/HW during an emergency situation where there is danger to the health or safety of personnel or danger of damage to the ship.

### **Collecting Hazardous Waste**

When you collect HW, segregate it, place it in containers used for the original material or in impervious containers specified for that material. Label it to show contents and store it in appropriate locations. Follow the stowage precautions used for oil pollution abatement including the segregation of oily wastes, used oil, and waste oil. If your ship has oily waste holding tanks, direct all shipboard oily waste to those tanks. Collect used lube oil separately, store it, and label it to be recycled ashore. Also collect synthetic lube oils and hydraulic oils separately from other used/waste oils. If your ship does not have a system to collect used synthetic oils, use 5- or 55-gallon steel containers, properly labelled, and store them to be recycled ashore. Refer to the *Naval Ships' Technical Manual*, "Pollution

Control", Chapter 593, for details. Also, see the *Navy Occupational Safety and Health (NAVOSH) Program Manual*, OPNAVINST 5100-19B, for instructions on the emergency response to and disposal of HM/HW.

## **Shore Requirements for Off-loading HW**

Give HW to the supply department, which will collect all the ship's HW and off-load it to the appropriate shore facility (usually the public works center) as HMTID using the following procedures:

- The supply officer contacts the appropriate shore activity to ask for a pickup and learn local requirements.
- The providing ship's department packs any turn-in material in approved DOD containers provided by the supply department and labels them as to contents. Do not mix different substances in the same container. If you do, the shore facility may charge your ship for the cost of laboratory analysis to identify the HW.
- Complete a DD form 1348-1 for each type of HW.

## **HM/HW TRAINING**

Work center supervisors will train all newly reported personnel on HM/HW when they report on board, and annually thereafter in the following subjects:

- The types of HM in their work area and aboard ship
- What HW is and how to dispose of it
- How to read and interpret hazard warning labels
- What an MSDS is, how to read it, and where a copy is available for review
- General information on HM handling, stowage, use, and disposal
- Protective measures when handling HM
- Emergency procedures

Damage control teams that may be required to handle HM/HW emergencies will receive annual training on HM/HW emergency procedures. This will include at least one drill.

